National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: June 2, 1997

In reply refer to: A-97-35

Mr. Barry L. Valentine
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

The National Transportation Safety Board has investigated two accidents in which failure of a Teledyne Continental Motors (TCM) alternator coupling resulted in a total loss of engine power. The first accident, which occurred at Clarksburg, Tennessee, on August 19, 1994, involved a Cessna 172XP airplane with a TCM IO-360-K engine. The accident circumstances are described in the following excerpt from the Safety Board's brief of the accident:

> While en route to his destination airport, the pilot experienced complete loss of engine power. The pilot selected a pasture and made an emergency landing. During the rollout, the airplane collided with trees along a fence line. Examination of the engine disclosed that the alternator drive coupling failed, and debris from the coupling lodged in the engine oil pump drive; the engine experienced a loss of engine oil pressure.

The Safety Board determined that the probable causes of this accident were the failure of the alternator drive coupling, and debris from the failed coupling that lodged in the engine oil pump, resulting in a sheared oil pump drive shaft. The engine subsequently failed because of oil starvation.

TCM Service Bulletin (SB) 95-3A, "Alternator/Generator Drive Coupling Inspection," was issued May 10, 1995, after field reports and inspection of coupling assemblies revealed parts that were severely worn or damaged. The bulletin applies to two types of couplings, both driven by an engine accessory drive gear. The first is an assembled coupling consisting of a drive gear, sleeve, two bushings, and a retainer. The second, a newer, improved slip-coupling, is an integral, one-piece unit. The bulletin provides for inspection of the couplings and routine replacement of the assembled couplings' bushings and retainer to preclude the possibility of failure and indicates that couplings with more than 500 hours total time in service should be inspected within the next 25 hours of operation and every 500 hours thereafter.

The second accident, which occurred at Grayling, Alaska, on April 20, 1996, involved a Maule M-5-210C airplane with a TCM IO-360-D engine. The accident circumstances are described in the following excerpt from the Safety Board's brief of the accident:

> The certificated private pilot departed a remote airstrip. About 1,000 feet above the ground, the engine quit. The pilot performed an emergency landing on soft snow covered terrain and the airplane nosed over. An engine examination revealed that the alternator drive coupling, consisting of a hub, retainer and bushing, fragmented within the engine. The alternator drive shaft and the oil pump gear were fractured when fragments of the retainer were enmeshed in the engine accessory gear teeth that drove both accessories. The number 6 cylinder connecting rod failed and penetrated the engine case due to a lack of lubrication. The engine, including the alternator, was overhauled 250 hours before the accident. An engine manufacturer's service bulletin recommended inspection and replacement of the standard alternator drive coupling every 500 hours. The engine manufacturer offered a one piece alternator drive coupling in which the retainer, bushing and hub were bonded together as one unit.

The Safety Board determined that the probable causes of this accident were the disintegration of the alternator drive coupling, jamming of the accessory drive gear, shearing of the oil pump drive, oil starvation, and failure of the number 6 cylinder connecting rod. Non-compliance with a manufacturer's service bulletin and soft snow were factors in the accident.

The Safety Board concludes that periodic inspection of the alternator couplings and routine replacement of the assembled couplings' bushings and retainer will prevent further in-service failures and potential loss of engine power. Therefore, the Safety Board believes that the FAA should issue an airworthiness directive applicable to all TCM C-75, C-85, C-90, C-115, C-125, C-145, E-165, E-185, E-225, O-200, 0-300, GO-300, GIO-300, IO-240, IO-360, TSIO-360, and LTSIO-360 model engines that utilize alternator/generator drive couplings, requiring that drive couplings with more than 500 hours time in service be inspected in accordance with TCM SB 95-3A at the next annual or 100-hour inspection, whichever occurs first, and every 500 hours time in service thereafter.

Therefore, the National Transportation Safety Board recommends the following to the Federal Aviation Administration:

> Issue an airworthiness directive applicable to all Teledyne Continental Motors (TCM) C-75, C-85, C-90, C-115, C-125, C-145, E-165, E-185, E-225, O-200, 0-300, GO-300, GIO-300, IO-240, IO-360, TSIO-360, and LTSIO-360 model engines that utilize alternator/generator drive couplings, requiring that drive couplings with more than 500 hours time in service be inspected in accordance with TCM Service Bulletin 95-3A at the next annual or 100-hour inspection, whichever occurs first, and every 500 hours time in service thereafter. (A-97-35)

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in this recommendation.

by: Jim Hall
Chairman